AMENDMENTS TO THE CLAIMS

1. (Original) A method of writing a waveguide along a waveguide propagation axis in a substrate, the method comprising the steps of:

directing an ultrashort laser beam to the substrate in transverse relation to the waveguide propagation axis to generate an ultrashort laser pulse focus in the substrate;

modifying a refractive index in an affected region in the substrate along the waveguide propagation axis via the ultrashort laser pulse focus; and

moving the ultrashort laser pulse focus in a direction other than the waveguide propagation axis to generate a widened affected region along the waveguide propagation axis;

wherein –

the widened affected region has a cross-sectional profile capable of supporting a fundamental mode of a signal having a telecommunications infrared (TIR) wavelength, and

wherein the affected region has a cross-sectional profile incapable of supporting the fundamental mode of the signal having the TIR wavelength.

2. (Original) The method of claim 1 wherein the ultrashort laser pulse beam is depolarized.

3 (Original) The method of claim 1 wherein the ultrashort laser pulse beam has a polarization in a direction parallel to the waveguide propagation axis.

4. (Original) The method of claim 1 wherein the moving step is performed during performance of the modifying step.

5. (Original) The method of claim 4 wherein the moving step comprises rastering the ultrashort laser pulse focus continuously with movement along the waveguide propagation axis.

6. (Original) The method of claim 1 wherein the modifying step comprises scanning a first path along the waveguide propagation axis such that the affected region along the first path comprises a first portion of the waveguide.

7. (Original) The method of claim 6 wherein:

the moving step comprises skipping the laser pulse focus to a new position in the direction other than the waveguide propagation axis; and

the modifying step further comprises scanning a second path starting from the new position and continuing along the waveguide propagation axis;

such that the affected region along the second path comprises a second portion of the waveguide.

8. (Original) The method of claim 7 wherein the skipping and scanning steps are both repeated such that a total of at least about seven adjacent affected regions are generated and together constitute the widened affected region.

9. (Original) The method of claim 8 wherein the cross-sectional profile of the widened affected region has an effective rectilinear shape.

10. (Original) The method of claim 8 wherein the scanning steps for adjacent affected regions are not performed sequentially.

11. (Original) The method of claim 7 wherein the first and second portions of the waveguide are separated by a center-to-center distance of about 0.5 microns.

12. (Original) The method of claim 7 wherein the first and second portions of the waveguide are separated by a center-to-center distance of about 1.0 micron.

13. (Original) The method of claim 7 wherein the scanning steps associated with the first and second portions of the waveguide are repeated such that the ultrashort laser pulse focus retraces the first and second portions.

14. (Original) The method of claim 13 wherein the scanning steps are repeated about four times and after each repetition of the scanning step for one of the first and second portions of the waveguide that produces an incremental modification of the refractive index in the affected region, the other portion is scanned.

15. (Original) The method of claim 7 further comprising the step of adjusting a scanning speed for the scanning of the second path.

16. (Original) The method of claim 7 further comprising the step of adjusting the ultrashort laser pulse beam to change a power level for the scanning of the second path.

17. (Withdrawn) A method of writing a waveguide along a waveguide propagation axis in a substrate, the method comprising the steps of:

directing an ultrashort laser beam to the substrate in transverse relation to the waveguide propagation axis to generate an ultrashort laser pulse focus in the substrate;

modifying a refractive index in an affected region in the substrate along the waveguide propagation axis via the ultrashort laser pulse focus; and

scanning the ultrashort laser pulse focus in a direction other than the waveguide propagation axis to generate a widened affected region along the waveguide propagation axis;

wherein the scanning step is performed during performance of the modifying step.

18. (Withdrawn) The method of claim 17 wherein the scanning step is performed continuously during movement along the waveguide propagation axis.

19. (Withdrawn) The method of claim 17 further comprising the step of adjusting a scanning speed of the ultrashort laser beam during the scanning step.

20. (Withdrawn) The method of claim 17 further comprising the step of adjusting the ultrashort laser pulse beam to change a power level during the scanning step to obtain a predetermined cross-sectional profile of the widened affected region.

21. (Withdrawn) The method of claim 17 wherein the scanning step comprises adjusting the direction through a bend in the waveguide propagation axis.

22. (Withdrawn) The method of claim 21 wherein the direction is orthogonal to the waveguide propagation axis.

23. (Withdrawn) The method of claim 17 wherein the scanning step includes the step of mechanically rastering the ultrashort laser pulse focus.

24. (Withdrawn) The method of claim 17 wherein the scanning step includes the step of acousto-optically rastering the ultrashort laser pulse focus.

25. (Withdrawn) The method of claim 17 wherein –

the widened affected region has a cross-sectional profile capable of supporting a fundamental mode of a signal having a telecommunications infrared (TIR) wavelength, and

the affected region has a cross-sectional profile incapable of supporting the fundamental mode of the signal having the infrared wavelength.

26. (Withdrawn) The method of claim 17 wherein the ultrashort laser pulse beam is depolarized.

27. (Withdrawn) The method of claim 17 further comprising the step of depolarizing the ultrashort laser pulse beam.

28. (Withdrawn) The method of claim 17 wherein the ultrashort laser pulse beam has a polarization in a direction parallel to the waveguide propagation axis.

29. (Withdrawn) The method of claim 17 wherein the modifying and scanning steps are repeated such that the ultrashort laser pulse focus retraces the widened affected region.

30. (Withdrawn) A method of writing a waveguide along a waveguide propagation axis in a substrate, the method comprising the steps of:

directing an ultrashort laser pulse beam to the substrate in transverse relation to the waveguide propagation axis to generate an ultrashort laser pulse focus in the substrate;

modifying a refractive index in an affected region in the substrate along the waveguide propagation axis via the ultrashort laser pulse focus; and

moving the ultrashort laser pulse focus in a direction other than the waveguide propagation axis to generate a widened affected region along the waveguide propagation axis;

wherein the ultrashort laser pulse beam has a polarization in a direction parallel to the waveguide propagation axis.

31. (Withdrawn) The method of claim 30 wherein the modifying step comprises adjusting the polarization of the ultrashort laser pulse beam to accommodate a bend in the waveguide propagation axis.

32. (Withdrawn) The method of claim 30 wherein the modifying step comprises scanning a first path along the waveguide propagation axis such that the affected region comprises a first portion of the waveguide.

33. (Withdrawn) The method of claim 32 wherein:

the moving step comprises skipping the laser pulse focus in the direction other than the waveguide propagation axis; and

the modifying step further comprises scanning a second path along the waveguide propagation axis subsequent to the skipping step;

such that the affected region comprises a second portion of the waveguide.

34. (Withdrawn) The method of claim 33 wherein the skipping and scanning steps are both repeated such that a total of at least about seven adjacent affected regions are generated and together constitute the widened affected region.

35. (Withdrawn) The method of claim 34 wherein each respective affected region is incapable of supporting the fundamental mode of the signal having the telecommunications infrared (TIR) wavelength.

36. (Withdrawn) The method of claim 34 wherein the cross-sectional profile of the widened affected region has an effective rectilinear shape.

37. (Withdrawn) The method of claim 33 wherein the first and second portions of the waveguide are separated by a center-to-center distance of about 0.5 microns.

38. (Withdrawn) The method of claim 33 wherein the first and second portions of the waveguide are separated by a center-to-center distance of about 1.0 micron.

39. (Withdrawn) The method of claim 33 wherein the scanning steps associated with the first and second portions of the waveguide are repeated such that the ultrashort laser pulse focus retraces the first and second portions.

40. (Withdrawn) The method of claim 33 wherein the scanning steps are repeated about four times and after each repetition of the scanning step for one of the first and second portions of the waveguide that produces an incremental modification of the refractive index in the affected region, the other portion is scanned.

41. (Withdrawn) The method of claim 30 wherein the moving step is performed during performance of the modifying step.

42. (Withdrawn) The method of claim 30 wherein the moving step comprises rastering the ultrashort laser pulse focus continuously with movement along the waveguide propagation axis.

43. (Withdrawn) An optical waveguide device disposed in a substrate along a waveguide propagation axis, comprising:

a plurality of adjacent waveguide portions disposed along the waveguide propagation axis, each waveguide portion having a cross-sectional refractive index profile incapable of supporting a fundamental mode of a signal having a telecommunications infrared (TIR) wavelength;

wherein the plurality of adjacent waveguide portions have a collective cross-sectional refractive index profile capable of supporting a fundamental mode of the signal having the TIR wavelength.

44. (Withdrawn) The optical waveguide device of claim 43 wherein the collective cross-sectional refractive index profile has an effective rectilinear shape.

45. (Withdrawn) The optical waveguide device of claim 43 wherein the collective cross-sectional refractive index profile is uniform.

46. (Withdrawn) The optical waveguide device of claim 43 wherein the plurality of adjacent waveguide portions form a contiguous waveguide profile.

47. (Withdrawn) The optical waveguide device of claim 46 wherein the contiguous waveguide profile has a non-uniform refractive index profile.

48. (Withdrawn) The optical waveguide device of claim 43 wherein the plurality of adjacent waveguide portions do not overlap.

49. (Withdrawn) A method of writing a waveguide along a waveguide propagation axis in a substrate, the method comprising the steps of:

directing an ultrashort laser pulse beam to the substrate in transverse relation to the waveguide propagation axis to generate an ultrashort laser pulse focus in the substrate; and

painting a widened affected region along the waveguide propagation axis using the ultrashort laser pulse focus;

wherein the ultrashort laser pulse beam is depolarized.

50. (Withdrawn) The method of claim 49 wherein the painting step includes adjusting the polarization of the ultrashort laser pulse beam.

51. (New) A method of writing a waveguide along a waveguide propagation axis in a substrate, the method comprising the steps of:

directing an ultrashort laser beam to the substrate in transverse relation to the waveguide propagation axis to generate an ultrashort laser pulse focus in the substrate;

modifying a refractive index in an affected region in the substrate along the waveguide propagation axis via the ultrashort laser pulse focus; and

moving the ultrashort laser pulse focus in a direction other than the waveguide propagation axis to generate a widened affected region along the waveguide propagation axis.